(Translation)

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SPECIFICATION

1. TITLE OF THE INVENTION

HELICAL SCAN TYPE MAGNETIC RECORDING AND REPRODUCING DEVICE

2. SCOPE OF CLAIMS FOR PATENT

1. A helical scan type magnetic recording and reproducing device comprising:

first means for traveling a magnetic tape in a half-loading state immediately after loading and immediately before ejecting a tape cassette;

second means for recording and reproducing a cue signal on the magnetic tape traveling in the half-loading state;

third means for storing the cue signal reproduced in the second means; and

fourth means for displaying a headline representing a content and a recorded position of a program recorded on the tape cassette based on the cue signal stored in the third means; wherein

the cue signal is reproduced from the magnetic tape and stored in the third means, and the headline is displayed on the fourth means immediately after loading the tape cassette; and

the cue signal is read out from the third means and recorded on the magnetic tape when ejecting the tape cassette, and thereafter, the tape cassette is ejected.

2. The helical scan type magnetic recording and reproducing device according to claim 1, wherein

a timer roller is arranged in a tape traveling system, a traveling speed of the magnetic tape traveling in the half-loading state at least being detectable.

3. DETAILED DESCRIPTION OF THE INVENTION

[Industrial Applicability]

The present invention relates to a helical scan type magnetic recording and reproducing device, and in particular, to recording and reproducing a cue signal representing a content etc. of a program recorded on a magnetic tape.

[Conventional Art]

Although a greater number of programs can be recorded on

one tape cassette as the recording and reproduction time per one tape cassette becomes longer, when desiring to reproduce a necessary program, at which position of the tape cassette the relevant program is recorded needs to be known.

Conventionally, as described in Journal of SMPTE Vol. 84 July 1975 p. 562-563, since a frame number signal has been recorded in a longitudinal track of the magnetic tape, the recorded program can be searched by specifying the frame number when the frame number of the recording starting position of the necessary recorded program is known.

However, in order to search the necessary recorded program, what kind of program is recorded at what position of the tape cassette needs to be known. Therefore, the general user performs more search for the necessary recorded program by search reproduction, the number of recorded programs per one tape cassette increases, and the number of tape cassettes increases, whereby it takes a long time to search for the necessary recorded program.

Various attempts have been made to record a digital signal etc. representing a headline including a frame number of the recording starting position, date, content, and the like of each recorded program in addition to the frame number signal in the longitudinal track of the magnetic tape. The content of the program recorded on one tape cassette can be obtained, although schematically, and the recorded position of the necessary recorded program can be known by reproducing the headline. Even when recording a new program in the tape cassette, the headline can be simultaneously corrected so that the content of the headline and the recorded program in the tape cassette recorded with the program always correspond one to one.

[Problems to be Solved by the Invention]

The recorded position of the headline cannot be changed after being determined once. Normally, the headline is recorded at the start of winding of the magnetic tape. In a case where the tape cassette is used once, the magnetic tape is not re-winded to the start of winding but is usually in a winded state when ejected from the magnetic reproducing device. Thus, in order to reproduce the necessary recorded program, after loading the tape cassette into the magnetic recording and reproducing device, the headline is reproduced after rewinding

the tape cassette once to the start of winding and whether or not the relevant recorded program is recorded on the relevant tape cassette needs to be known, and thus a considerable amount of time is necessary to find out the recorded content of the tape cassette.

The present invention resolves such problems, and provides a helical scan type magnetic recording and reproducing device capable of rapidly finding out the recorded content of the tape cassette.

[Means for Solving the Problems]

In order to achieve the above aim, according to the present invention, during non-usage of the tape cassette, a cue signal representing a headline with respect to a program of the magnetic tape is recorded in a cue track of the magnetic tape in the tape cassette, the cue signal is reproduced and erased with loading of the tape cassette to the magnetic recording and reproducing device, and the reproduced cue signal is stored in the memory to screen display the headline; and at the termination of use of the tape cassette, the cue signal is read out from the memory and recorded in the cue track, and thereafter, the tape cassette is ejected.

[Operation]

In the tape cassette during non-use, the cue signal is recorded at a portion between the supply reel and the winding reel of the magnetic tape or the vicinity of the relevant portion. Thus, when the tape cassette is loaded to the magnetic recording and reproducing device, the cue signal can be reproduced with a slight traveling of the magnetic tape, whereby what program is recorded at which position of the tape cassette can be known immediately after the tape cassette is loaded. In rewriting the recorded program or recording a new program, the stored content of the memory is modified so that the content of the headline and the recorded program in the tape cassette always correspond one to one.

[Embodiments]

One embodiment of the present invention will now be described with reference to the figures.

Fig. 1 is a configuration view showing a tape traveling system, where reference numeral 1 denotes a tape cassette, reference numeral 2 denotes a magnetic tape, reference numeral

3 denotes a supply reel, reference numeral 4 denotes a winding reel, reference numeral 5 denotes a cylinder, 6 and 7 are rotation heads, reference numeral 8 denotes a cylinder entrance side inclination guide, reference numeral 9 denotes a cylinder entrance side width regulating guide, reference numeral 10 denotes a cylinder exit side inclination guide, reference numeral 11 denotes a cylinder exit side width regulating guide, reference numeral 12 denotes an opening, reference numeral 13 denotes an impedance roller, reference numeral 14 denotes an all-width erase head, 15 and 16 are fixed guides, reference numeral 17 denotes a tension pin, reference numeral 18 denotes a cassette exit side guide, reference numeral 19 denotes a cassette entrance side guide, reference numeral 20 denotes a capstan, reference numeral 21 denotes a pinch roller, reference numeral 22 denotes a width regulating fixed guide, reference numeral 23 denotes a compound recording and reproducing head, reference numeral 24 denotes a compound erase head, reference numeral 25 denotes a pull-out pin, reference numeral 26 denotes a timer roller, reference numeral 27 denotes a detection head, reference numeral 28 denotes a supply reel directly-coupled motor, and reference numeral 29 denotes a winding reel directly-coupled motor.

According to the figure, during non-usage of the tape cassette 1, the magnetic tape 2 is stretched from the supply reel 3 to the winding reel 4 by way of the cassette exit side guide 18 and the cassette entrance side guide 19, and the magnetic tape 2 traverses two openings 12 formed in the tape cassette 1 between the cassette exit side guide 18 and the cassette entrance side guide 19.

When the tape cassette 1 is loaded to the magnetic recording and reproducing device, the cylinder entrance side inclination guide 8, the cylinder entrance side width regulating guide 9, and the tension pin 17 are arranged on the far side of the magnetic tape 2 of one opening 12, and the cylinder exit side inclination guide 10, the cylinder exit side width regulating guide, and the pull-out pin 25 incorporated in the timer roller 26 are arranged on the far side of the magnetic tape 2 of the other opening 12. The supply reel 3 is mounted on a reel board (not shown) directly coupled to the supply reel directly-coupled motor 28, and the winding reel 4

is mounted to a reel board (not shown) directly coupled to the winding reel directly-coupled motor 29.

In the relevant state, the timer roller 26, and thus the pull-out pin 25 move along the arrow F, and the magnetic tape 2 is pulled out from the tape cassette 1 by the pull-out pin 25. When the pull-out pin 25 is in a state indicated by reference numeral 25', a tape path shown with a solid line is formed in which the magnetic tape 2 contacts only the pull-out pin 25', the compound erase head 24, the compound recording and reproducing head 23, and the width regulating fixing guide 22 between the cassette exit side guide 18 and cassette entrance side guide 19, and a half-loading state is obtained.

As shown in Fig. 2, in the magnetic tape 2, a control track 30 is formed on one edge in the width direction and an audio track 31 is formed on the other edge respectively in a tape longitudinal direction, and an image signal recording track 32 recorded with a program in a diagonal direction is formed between the control track 30 and the audio track 31. A cue track 33 is arranged in a tape longitudinal direction between the audio track 31 and the image signal recording track 32, where a cue signal 34 is recorded at one location of the cue track 33 before the tape cassette 1 is loaded to the magnetic recording and reproducing device.

As shown in Fig. 3, the compound recording and reproducing head 23 includes an audio head 35, a control head 36, and a cue head 37, and the compound erase head 24 includes an audio erase head 38 and a cue erase head 39, as also shown in Fig. 3.

In Fig. 1, when the tape path is in the half-loading state shown with a solid line, the audio head 35 and the audio erase head 38 shown in Fig. 3 contact the audio track 31 shown in Fig. 2 on the magnetic tape 2, and similarly, the cue head 37 and the cue erase head 39 contact the cue track 33 and the control head 36 contact the control track 30.

In the half-loading state, the detection head 27 faces the timer roller 26'. Fig. 4 shows the timer roller 26, the pull-out pin 25, and moving means thereof. In the figure, a boss 46 of a cylindrical shape is arranged at the distal end of an arm 45 rotatable with respect to a supporting point (not shown), where a shaft 40 is arranged so as to pass through the inside of the boss 46 and so as to be rotatable with respect

to the boss 46 by ball bearings 43, 44 arranged on the inner surface of the boss 46. The timer roller 26 is fixed by means such as screwing at the lower part of the boss 46 of the shaft 40, and a roller 42 including members which friction coefficient of the surface is high such as rubber is fixed by means such as press-fitting at the upper part of the boss 46 of the shaft 40. The roller 42 becomes the pull-out pin 25 in Fig. 1. A magnetic layer 41 formed with a magnetized pattern at equal distance in the circumferential direction is arranged at the outer peripheral part of the timer roller 26, and the detection head 27 faces the magnetic layer 41 in the half-loading state. In the relevant configuration, when the arm 45 rotates with the supporting point as the center, the pull-out pin 25 and the timer roller 26 move along arrow F or in the opposite direction in Fig. 1.

In the half-loading state after the tape cassette 1 shown in Fig. 1 is loaded, the cue signal is reproduced from the magnetic tape 2. That is, when the half-loading state is obtained as shown in the figure, the winding reel 4 is rotated with the winding reel directly-coupled motor 29 and the magnetic tape 2 is made to travel in the forward direction while providing a back tension to the magnetic tape 2 with the supply reel directly-coupled motor 28. The detection head 27 detects the magnetized pattern of the outer peripheral part of the timer roller 26' and generates a pulse, and the winding reel directly-coupled motor 29 is controlled using such a pulse so that the frequency of the pulse becomes constant, that is, the magnetic tape 2 travels at a constant speed.

The cue head 37 (Fig. 3) of the compound recording and reproducing head 23 scans the cue track 33 (Fig. 2) of the magnetic tape 2 by the traveling of the magnetic tape 2, and the magnetic tape 2 is stopped when the cue head 37 reproduces the cue signal. The supply reel 3 is then rotated to travel the magnetic tape 2 in the opposite direction while providing a back tension to the magnetic tape 2 by the winding reel directly-coupled motor 29. During traveling of the magnetic tape 2 in the opposite direction, the cue signal 34 recorded on the cue track 33 of the magnetic tape 2 is erased by the cue erase head 39 (Fig. 3) of the compound erase head 24. The reproduced cue signal is recorded in the memory as hereinafter

described and is used to screen display a headline of a program recorded on the magnetic tape 2.

The program recorded in the tape cassette 1 and the recorded position thereof are found by the screen display of the headline, and search is performed in the half-loading state when search for the desired recorded program is instructed. After such search is terminated or instruction of recording and reproduction (reproduction performed immediately after the loading of the tape cassette without performing search) is made, the magnetic tape 2 is pulled out from the tape cassette 1 while the cylinder entrance side inclination guide 8, the cylinder entrance side width regulating guide 9, and the tension pin 17 move along directions A, B, and C from the half-loading state, and a state indicated with reference numerals 8', 9', and 17' is obtained. The cylinder exit side inclination guide 10 and the cylinder exit side width regulation guide 11 also move along directions D and E, and the magnetic tape 2 is pulled out from the tape cassette 1 in the middle to obtain a state indicated with reference numerals 10' and 11'. The pinch roller 21 also moves along the arrow G, and waits for the magnetic tape 2 with the capstan 20.

According to the above operation, the tape path is as shown with a chain double-dashed line from the cassette exit side guide 18 to the pull-out pin 25', as shown with a solid line from the pull-out pin 25' to the width regulating fixing guide 22, and as shown with a chain double-dashed line from the width regulating fixing guide 22 to the cassette entrance side guide 19, where a full-loading state is obtained and recording of program or reproduction of recorded program is carried out.

In ejecting the tape cassette 1, the cylinder entrance side inclination guide 8, the cylinder entrance side width regulating guide 9, the tension pin 17, the cylinder exit side inclination guide 10, the cylinder exit side width regulating guide 11 and the pinch roller 21 operate opposite to the above, and the magnetic tape 2 is winded by the supply reel 3 or the winding reel 4 thereby obtaining a half-loading state of the tape path as shown with a solid line. Subsequently, back tension is applied to the magnetic tape 2 by the supply reel directly-coupled motor 28, the winding reel directly-coupled motor 29 is controlled based on the pulse signal from the

detection head 27, and the magnetic tape 2 is made to travel in the forward direction at a constant speed. In this case, the cue signal is read from the memory, provided to the cue head 37 (Fig. 37) of the compound recording head 23, and recorded on the cue track 33 (Fig. 2) of the magnetic tape 2.

After the recording of the cue signal is finished, the magnetic tape 2 is stopped once, and thereafter, back tension is applied to the magnetic tape 2 by the winding reel directly-coupled motor 29, the supply reel directly-coupled motor 28 is controlled based on the pulse signal from the detection head 27, the magnetic tape 2 is made to travel in the opposite direction at a constant speed, and the magnetic tape 2 is stopped after traveling an amount required to record the cue signal. The pull-out pin 25' and the timer roller 26' move in the direction opposite to the arrow F, and the magnetic tape 2 is winded by the supply reel 3 or the winding reel 4 and accommodated in the tape cassette 1. Thereafter, the tape cassette 1 is ejected.

In the ejected tape cassette 1, the cue signal recorded position in the longitudinal direction of the tape differs depending on the winding state of the magnetic tape 2, and furthermore, the recorded position is at the portion between the supply reel 3 and the winding reel 4 of the magnetic tape 2 or the vicinity of the relevant portion, where when the tape cassette 1 is loaded, the half-loading state is obtained and the cue signal is immediately and rapidly reproduced. Thus, when the tape cassette 1 is loaded to the magnetic recording and reproducing device, what program is recorded in the tape cassette 1 and which position each program is recorded can be known.

Fig. 5 is a block diagram showing a signal system for recording and reproducing the cue signal, where reference numeral 50 denotes a recording reproducing amplifier, reference numeral 51 denotes a demodulator, reference numeral 52 denotes a modulator, reference numeral 53 denotes a nonvolatile memory, reference numeral 54 denotes a character generator, reference numeral 55 denotes a monitor, reference numeral 56 denotes a head drive circuit, reference numeral 57 denotes a system control circuit, reference numeral 58 denotes a recording reproducing amplifier, reference numeral 59 denotes a

demodulator, and reference numeral 60 denotes a modulator, where the same reference numerals are denoted for the portions corresponding to Fig. 1.

When the tape cassette is loaded to the magnetic recording and reproducing device, a loading mechanism (not shown) operates according to a command of the system control circuit 57, the tape path of solid line shown in Fig. 1 is formed, and the half-loading state is obtained.

The system control circuit 57 supplies a voltage for applying a constant back tension to the magnetic tape to the supply reel directly-coupled motor 28, supplies a tape drive voltage to the winding reel directly-coupled motor 29, and travels the magnetic tape in the forward direction. In this case, the pulse signal is provided from the detection head 27 to the system control circuit 57, and supply voltage to the supply reel directly-coupled motor 28 and the winding reel directly-coupled motor 29 is controlled so that the frequency of the pulse signal becomes constant. The travel speed of the magnetic tape thus becomes constant.

After the magnetic tape starts scanning, when the cue signal is reproduced by a cue head 37, this cue signal is stored in a nonvolatile memory 53 after being amplified by a recording reproducing amplifier 50 and demodulated by a demodulator 51. When the reproduction of the cue signal ends, and the entirety is written in the nonvolatile memory 53, a reading of the cue signal from the nonvolatile memory 53 is started. This cue signal is converted into a character signal by a character generator 54 and is supplied to the monitor 55. Thus, at monitor 55, the headlines are displayed which represent the contents, recording start position (recording address), date and the like of each of the recording program recorded on the installed tape cassette.

Furthermore, when the cue signal is written to the nonvolatile memory 53, a write finish signal and the recording address of each recorded program are provided to the system control circuit 57. The system control circuit 57 stops supplying voltage to the supply reel directly-coupled motor 28 and the winding reel directly-coupled motor 29, stops the magnetic tape, supplies the voltage for applying back tension to the magnetic tape to the winding reel directly-coupled motor

29 and the tape driving voltage to the supply reel directly-coupled motor 28, travels the magnetic tape in the opposite direction, and provides an erase signal to the cue erase head 39 through the head drive circuit 56. The cue signal recorded on the magnetic tape is thereby erased. When the magnetic tape travels in the opposite direction by the same amount as in reproduction of the cue signal, the system control circuit 57 stops supplying voltage to the supply reel directly-coupled motor 28 and the winding reel directly-coupled motor 29, and stops the magnetic tape.

In order to travel the magnetic tape in the opposite direction by the amount the magnetic tape is made to travel in the forward direction during the reproduction of the cue signal, well-known tape count means, arranged in the system control circuit 57, for counting a control pulse is used. During traveling in the forward direction of the magnetic tape for reproduction of the cue signal, the control pulse reproduced by the control head 36 is provided to the system control circuit 57 via the recording reproducing amplifier 58 and the demodulator 59, and up-counted by the tape count means. The control pulse is provided to the system control circuit 57 from the control head 36 during traveling in the opposite direction of the magnetic tape for erasing the cue signal, but the tape count means is down-counted. When the count value becomes equal to the count value before the start of travel of the magnetic tape for reproducing the cue signal, the supply of voltage to the supply reel directly-coupled motor 28 and the winding reel directly-coupled motor 29 is stopped.

Subsequently, the magnetic tape becomes a full-loading state, and reproduction of the desired recorded program, recording of a new program, and the like are performed, where when a new program is recorded, the data of the content and the recorded position thereto are written in the nonvolatile memory 53 and added to the cue signal.

In ejecting the tape cassette, in the half-loading state, the system control circuit 57 supplies voltage to the supply reel directly-coupled motor 28 and the winding reel directly-coupled motor 29 in the above manner to travel the magnetic tape in the forward direction, and transmits a read-out command signal to the nonvolatile memory 53. The cue signal

is thereby read out from the nonvolatile memory 53, provided to the cue head via the modulator 52 and the recording reproducing amplifier 50, and recorded on the magnetic tape. After the read-out of the cue signal from the nonvolatile memory 53 is completed, the system control circuit 57 stops supply of voltage to the supply reel directly-coupled motor 28 and the winding reel directly-coupled motor 29, and stops the magnetic tape. The system control circuit 57 then supplies voltage to the supply reel directly-coupled motor 28 and the winding reel directly-coupled motor 29 in the above manner, and travels the magnetic tape in the opposite direction, and thereafter, stops supply of voltage to the supply reel directly-coupled motor 28 and the winding reel directly-coupled motor 29 and stops the magnetic tape when the magnetic tape is made to travel in the opposite direction by the traveling amount to record the cue signal. Subsequently, the magnetic tape is accommodated in the tape cassette, and the tape cassette is ejected, as described above.

Fig. 6 shows a configuration of one example of the cue signal.

The cue signal is configured by a digital signal, and as shown in Figure 6(a), comprises a pulse for synchronization indicating the leading position, digital data indicating the recording program contents, and an end signal indicating the end. Moreover, this digital data, as shown in Figure 6(b), shows the number indicating the recording order of the recording programs in the tape cassette (No), leading address and end address indicating the recording area, recording date and time, channel number of the broadcast station (in the case of an external input such as from a video camera, such matter is to be indicated), the contents of the recording program, and the like. Herein, the contents of the recording program are what differentiate whether the program is a sports program, movie program or the like, and the digital code for each content can be pre-set, and the contents can be inputted at the time of recording. Other digital data is obtained from a device (clock device etc.) of the magnetic recording and reproducing device. Regarding the address of the recording program, an address dedicated track can be provided to the magnetic tape and an address signal can be pre-recorded to this. Then, at the time

of recording and reproduction, this address signal can be reproduced to determine the recording position and reproducing position of the recording program. The address track may not be arranged in a dedicated manner, and the control track may be used as the address track, in which case, the address signal is recorded multiplexed with the control pulse.

A method of using the cue signal includes reading digital data related to the program content out of the cue signals stored in the memory, converting the data to a character signal in the character generator, and screen displaying the character signal as a headline on the monitor. When reproducing the desired recorded program, the number (number indicating the recorded order) is input by input means such as a numeric keypad, the magnetic tape is forwarded up to the leading address of the recorded program, and reproduction is started therefrom. When the address signal is multiplex-recorded in the control track, the leading address of Fig. 6(b) stored in the nonvolatile memory 53 and the address signal reproduced from the control track are compared in the system control circuit 57, and the magnetic tape is made to travel at high speed until the signals match in Fig. 5. When the headline is displayed on the monitor by the cue signal, the non-recorded location, the erasable location, and the like on the magnetic tape are determined, and recording of the program at the locations is performed.

Even without using address signals, although approximate, the address can be detected from the number of rotations of the reels when running the magnetic tape at a constant speed. This is because while the magnetic tape is traveling at a constant speed, the reel board has a different rotation number depending on the wounded amount of the tape. As described above, in the half-loading state, the magnetic tape is made to travel at a constant speed when reproducing the cue signal, and the approximate current address can be determined by detecting the rotation number of the reel board. Furthermore, when fast forwarding or re-winding in the half-loading state, the rotation number of the reel board with respect to the traveling speed of the magnetic tape in time of reproduction of cue signal is detected from the rotation number of the reel board and the detection pulse frequency of the detection head 27 (Fig. 1), and thus the address at this point can be detected. In enhancing

the detection accuracy of the address, the cue of the desired recorded program merely needs to be performed, and thus the cue signal etc. already used from the prior art may be used.

As apparent from the above description, the region where the cue signal is recorded in the cue track is a very small region, and no recording is performed on other portions. In a case where the cue track already defined with a tape pattern and a necessary track width thereof cannot be ensured, even when the cue track is formed partially into a redundant portion of the already defined tape pattern, the portion actually recorded with the cue signal is a short region, and thus influence on other signals is alleviated. The portion having the highest possibility of being the redundant portion is the overlapping recorded portion of the image signal recording track, that is, the portion adjacent to the audio track or the control track.

An example of forming a cue track is shown in Fig. 7. In order to record the cue signal 34, the magnetic tape is made to travel at a constant speed in the forward direction, and first, one part of an overlapping part of the image signal recording track 32 is erased by a desired length with the cue erase head 39 (Fig. 3), and the cue signal 34 is recorded to the erased portion by the cue head 37. Thus, the cue signal 34 is recorded slightly into the image signal recording track 32, but degradation of the reproduced image signal barely occurs since such a part is an overlapping part of the image signal and only one part thereof merely lacks for a short period of time. When recording the image signal, the cue signal is held in the memory as described above, and recording is performed as in the prior art including the overlapping part. In reproducing the cue signal, the image signal is slightly reproduced with the cue signal from the cue head 37, but since the cue signal is a digital signal, the cue signal can be detected without error when the synchronous signal shown in Fig. 6(a) is properly distinguished, which is sufficiently possible.

When the tape cassette used in the magnetic recording and reproducing device applied with the embodiment and performed with recording of the program is used to reproduce the program in the magnetic recording and reproducing device not applied with the embodiment, and thereafter, again used in the magnetic recording and reproducing device applied with the embodiment,

the recorded position of the cue signal might not be known. In such a case, when the tape cassette is loaded to the magnetic recording and reproducing device applied with the embodiment, the half-loading state is obtained, the magnetic tape is made to travel at a constant speed and the reproducing operation of the cue signal is started, but in a case where the cue signal is not reproduced even when the magnetic tape is made to travel for a constant time, the magnetic tape is re-winded once to the start of winding of the tape, and thereafter, the magnetic tape is made to travel for a constant speed in the forward direction until the cue signal is reproduced. Such control is performed by the system control circuit 57 (Fig. 1). Regarding the program recorded in the magnetic recording and reproducing device not applied with the embodiment, the tape cassette is loaded to the magnetic recording and reproducing device applied with the embodiment, the cue signal is reproduced from the magnetic tape and stored in the memory, and the program content with respect to the recorded program is input with the input means and stored in the memory. Furthermore, when using an unused tape cassette, the control pulse is not reproduced, and thus the reproducing operation of the cue signal is prohibited.

The Embodiment of the present invention has been described above, but the present invention is not limited only to such an embodiment.

That is, in the above embodiment, the cue track 33 is arranged on the audio track 31 side as shown in Figs. 2 and 6, but may be arranged on the control track 30 side.

In the above embodiment, the tape drive in the half-loading state is performed by a reel motor, but may obviously be a capstan drive, and the capstan may be rotated at a constant speed. In this case, the detection pulse of the detection head 27 does not need to be used to travel the magnetic tape at a constant speed to reproduce the cue signal, but the detection pulse of the detection head 27 is used in constant speed traveling of the magnetic tape in fast forwarding and re-winding since the reel drive needs to be performed.

In the above embodiment, although a slight time is necessary in loading and ejecting the tape cassette to record or reproduce the cue signal, the purpose can be sufficiently achieved with digital data of about 100 bits per one program,

and thus even when twenty programs are recorded per one tape cassette, the cue signal is about two kilobytes, whereby recording and reproducing of signal of about 10 KHz can be performed with a normal cue head, and recording and reproducing of the cue signal can be carried out with less than or equal to one second including rise and fall time of the tape speed. Thus, the operation is terminated in about two seconds including traveling of the magnetic tape in the opposite direction, and in particular, the user does not have to wait for a long time.

[Effects of the Invention]

As described above, according to the present invention, the content and the recorded position of the program recorded in the tape cassette can be immediately found after loading the tape cassette, and rapid search of the desired recorded program and effective use of the tape cassette can be achieved, where the entire configuration does not become complex as the circuit and the mechanism to be added are only few, and furthermore, the recorded state of the tape cassette can be acquired with a simple operation, and an advanced task such as editing of the program can be conveniently performed without imposing a burden on the user.

4. Brief Description of the Drawings

Fig. 1 to Fig. 7 respectively show one embodiment of a magnetic recording and reproducing device according to the present invention, in which

Fig. 1 is a configuration view showing a tape traveling system;

Fig. 2 is a tape pattern view showing one specific example of a method of recording a cue signal;

Fig. 3 is a plan view showing one specific example of a compound recording and reproducing head and a compound erase head in Fig. 1;

Fig. 4 is a cross sectional view showing one specific example of a pull-out pin, a timer roller, and moving means thereof in Fig. 1;

Fig. 5 is a block diagram showing a signal system for rerecording and reproducing a cue signal;

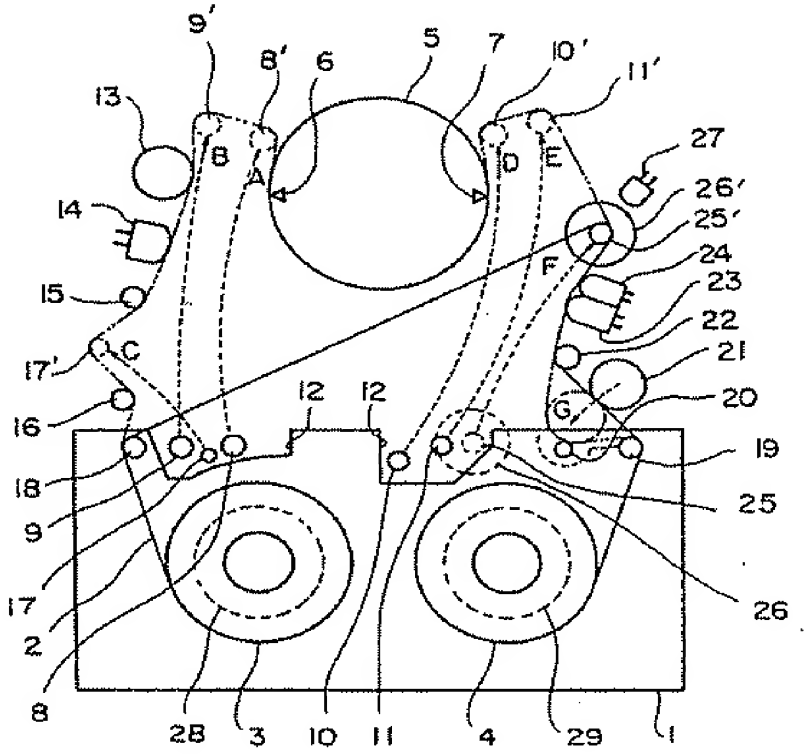
Fig. 6 is a frame format view showing a configuration of a cue signal; and

Fig. 7 is a tape pattern view showing another specific

example of a method of recording a cue signal.

1 Tape cassette
2 Magnetic tape
3 Supply reel
4 Winding reel
5 Cylinder
23 Compound recording and reproducing head
24 Compound erase head
25, 25' Pull-out pin
26, 26' Timer roller
27 Detection head
28 Supply reel directly-coupled motor
29 Winding reel directly-coupled motor
30 Control track
31 Audio track
32 Image signal recording track
33 Cue track
34 Cue signal
35 Audio head
36 Control head
37 Cue head
38 Audio erase head
39 Cue erase head
53 Nonvolatile memory
54 Character generator
55 Monitor
57 System control circuit

Fig.1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8'
6
5
7
10'
11'
13
B
A
D
E
27
26'
25'
14
F
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15
23
22
17'
C
21
12
12
G
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18
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9
17
26
2
8
28
3
10
11
4
29
1

Fig.2

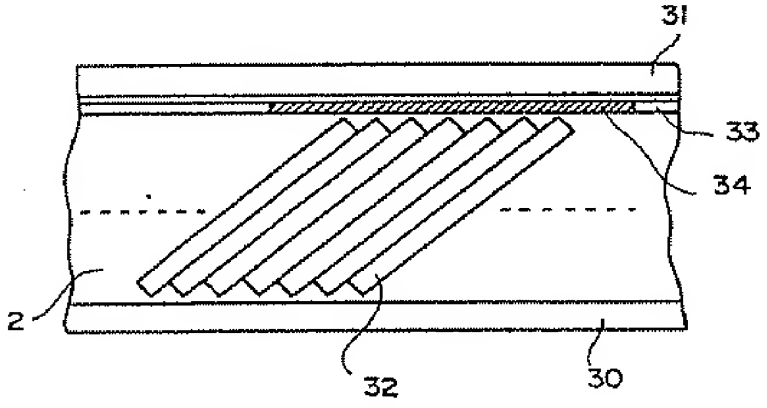

31
33
34
2
32
30

Fig.3

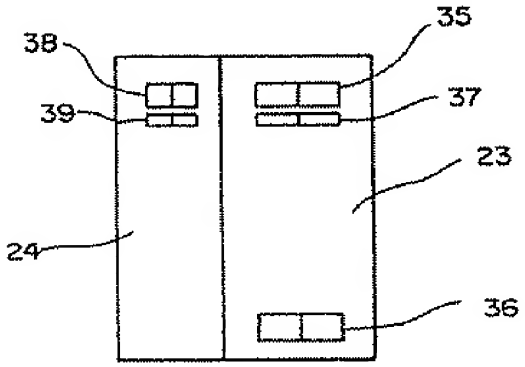


Fig.4

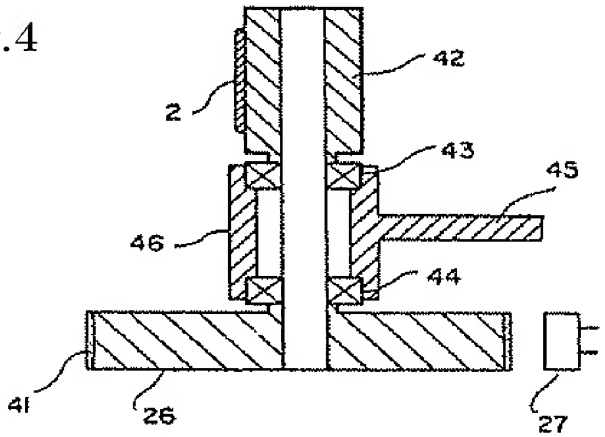


Fig.5

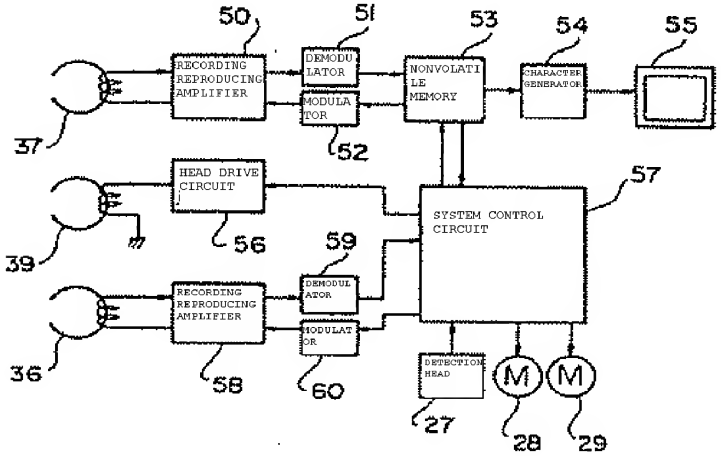


Fig.6

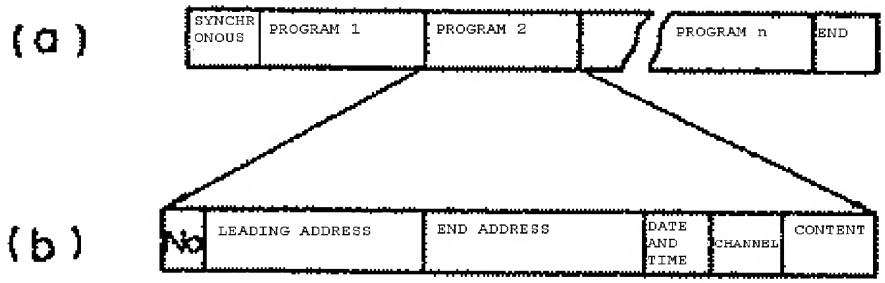
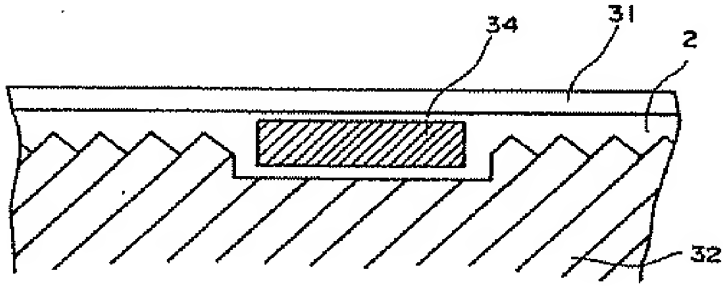

(a)
SYNCHR ONOUS
PROGRAM 1
PROGRAM 2
PROGRAM n
END
(b)
No
LEADING ADDRESS
END ADDRESS
DATE AND TIME
CHANNEL
CONTENT

Fig.7


34
31
2
32